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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/802,806	03/18/2004	Katsutoshi Izumi	021740A	5100
23850	7590	02/21/2006	EXAMINER	
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP			DOTY, HEATHER ANNE	
1725 K STREET, NW			ART UNIT	
SUITE 1000			PAPER NUMBER	
WASHINGTON, DC 20006			2813	

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/802,806

Applicant(s)

IZUMI ET AL.

Examiner

Heather A. Doty

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 3-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-6 is/are allowed.
- 6) ☒ Claim(s) 1 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 10/351,385.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Objections*

Claims 3-6 are objected to because of the following informalities: In claim 3, lines 3-4 should be changed to “a heating furnace in which is placed an SOI substrate having a surface silicon layer of a predetermined thickness on an insulator layer buried in the substrate ...” Appropriate correction is required. Claims 4-6 are objected to for depending from claim 3.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Steckl et al. (hereinafter Steckl-1, IEEE Transactions on Electron Devices, Vol. 39, No. 1, January 1992) in view of Steckl et al. (hereinafter Steckl-2, U.S. 5,759,908).

Regarding claim 1, Steckl-1 teaches a manufacturing apparatus of silicon carbide on silicon substrates comprising a heating furnace in which a silicon substrate is placed and which has a heating means for heating the substrate (pg. 66, second column, step f) recites heating the substrate), and a gas supply means for supplying a variety of gases into this heating furnace; and an exhaust means for exhausting gases within the heating furnace to outside (see “Toxic Clean” chamber in Fig. 1a—this chamber is connected to the heating furnace through vacuum lines, the molecular drag pump, and

the foreline pump), wherein the manufacturing apparatus is configured to control the heating means and the gas supply means (p. 66, third full paragraph) to increase an ambient temperature within said heating furnace while supplying a mixed gas of a hydrogen gas and of a hydrocarbon gas into said heating furnace so as to metamorphose said surface silicon layer of the substrate into a single-crystal silicon carbide thin film (see "carbonization" and "SiC growth" steps in Fig. 2; p. 67, paragraph bridging columns 1 and 2 discloses a single-crystal thin film), and in that a series of reactions within said heating furnace are conducted at atmospheric pressure (pg. 66, column 2, step d).

Steckl-1 does not expressly teach that the silicon substrate is a silicon-on-insulator substrate having a surface silicon layer of a predetermined thickness and a buried insulator.

However, Steckl-2 teaches a method of forming a SiC layer on an SOI substrate (column 2, lines 53-62) using the carbonization reaction taught in Steckl-1 (column 3, lines 21-23).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use the apparatus taught by Steckl-1 to manufacture a buried insulator layer-type semiconductor silicon carbide substrate, as taught by Steckl-2, because Steckl-2 expressly teaches that the carbonization reaction performed in the apparatus taught in Steckl-1 is appropriate and effective to manufacture silicon carbide films on SOI substrates.

***Allowable Subject Matter***

Claims 3-5 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: Prior art does not teach or suggest, in combination with the other claimed limitations, a manufacturing apparatus configured to control the heating means and gas supply means in order to replace mixed gas with an inert gas wherein an oxygen gas is mixed in a predetermined ratio and heat a substrate up to 550°C or higher so as to remove a carbon thin film through etching.

***Response to Arguments***

Applicant's arguments filed 12/8/2005 have been fully considered but they are not persuasive.

Regarding claim 1, Applicant argues that the combination of Steckl-1 and Steckl-2 does not teach or suggest a manufacturing apparatus of a buried-insulating-layer-type semiconductor silicon carbide substrate, which is operated at atmospheric pressure (p. 6, lines 1-4).

This argument is not persuasive because Steckl-2 teaches a SOI substrate (the insulating SiO<sub>2</sub> layer is buried beneath the top Si layer) onto which SiC is grown (Fig. 1) at atmospheric pressures (column 3, lines 17-20 and 34-35). Steckl-1 additionally teaches growing SiC at atmospheric pressures (p. 66, column 2, step d).

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

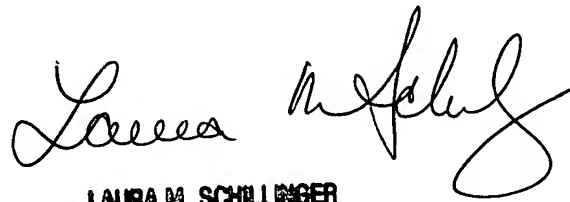
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had



LAURA M. SCHILLINGER  
PRIMARY EXAMINER